

**Review of revised version of “Evaluation of Southern Ocean cloud in the HadGEM3 general circulation model and MERRA-2 reanalysis using ship-based observations” by Kuma et al.
(acp-2019-201)**

Main comment:

I am satisfied with the improvements made by the authors to the manuscript, who made the efforts to address all my concerns. They have notably addressed the main issue which were the different time ranges used in the various simulations analysed. They better discuss their results. There are still few statements regarding what the authors try to demonstrate, which are not clear to me, esp. regarding GA vs MERRA performances. This should be improved before publication by either toning down some statements, or better demonstrating them. (minor revision)

Line by line comments (using the latexdiff document):

P3-L14: You should give a reference for AMPS:

Powers, J. G., Manning, K. W., Bromwich, D. H., Cassano, J.J., and Cayette, A. M.: A decade of Antarctic science sup-port through AMPS, B. Am. Meteorol. Soc., 93, 1699–1712, <https://doi.org/10.1175/BAMS-D-11-00186.1>, 2012.

P3-L22: the most recent study investigating SLW in the SO is the one by Listowski et al. 2019 I think, and it should appear here after Jolly et al. 2018:

Listowski, C., Delanoë, J., Kirchgaessner, A., Lachlan-Cope, T., and King, J.: Antarctic clouds, supercooled liquid water and mixed phase, investigated with DARDAR: geographical and seasonal variations, Atmos. Chem. Phys., 19, 6771–6808, <https://doi.org/10.5194/acp-19-6771-2019>, 2019.

P6-L13: AA15 is not labelled in Figure 1. I guess it is AA V1-V3.

P6-L14-15: Please double-check the sentence:

→ “...is present at all longitudes in the SO (section 5.1), affected by atmospheric circulation in the SO (...). (“in the SO” repeated twice)

P7-L9: Define here GNSS (this is only done at L18 for now).

P15-L27: peaking below 500m (not “km”)

P18-L2: there is no label b4, do you mean c4?

P18-L2-L3: This is not so clear or please explicit why you can say this. As it can possibly be said for (a1) and (a2), this is not so sure about the other sea-ice free cases.

Please explain (by quantifying biases?) how you see in Figure 8 that MERRA-2 is worse than GA7.1N.

P18-L34: I am not sure to agree (“is majority liquid”). Looking at Figure 9i: IWP>LWP!

P19-L3: is almost entirely liquid. Not ice (looking at Figure 9j)

P19-L9: in both models

P19-L14: similar

P20-L14: “Remarkably, the observed and simulated cloud occurrence profiles do not appear to be significantly different between the DJF and MAM seasons or different latitude bands between 55 and 70°S (Figure 5)”: I am not sure to agree with the authors, unless you specify what you mean by “significantly”. Looking at all the profiles in Figure 5 there are clear differences (multiple layers, single low layer, etc.). So, I am not sure about the rest of the paragraph either (“This is in contrasts...”). Please clarify and improve this part.

P21-L6-7: Following my comment on P18-L2-L3 I am not sure to agree with this or this is not convincingly demonstrated.

P21-L29: Are you referring to cold air outbreaks here? They tend to form cloud streets, and one expects models to struggle with these low clouds. Any reference here to back up your comment?

P21-L35: Rewrite here the references used in the intro, after “...in summer months”

P22-L31: Please give at least one reference here.

P23-L15-30: Since you define a new quantity in your study (SLL), this would be interesting to recall it here, and explain the benefit of using it.

Figures:

Figure 9: what are the contour labels? On subplots c, d, g, and h, one cannot see at all the different red contours. Please improve the figures, and indicate contour values (in the caption or in the plot).